

5005 COMPUTYPER

billing machine

by

Friden

TECHNICAL MANUAL

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SECTION I

INTRODUCTION



The 5005 COMPUTYPER* billing machine by FRIDEN is designed to accomplish a wide range of billing operations found in business and industry. This self-contained unit is operator-oriented and combines high-speed computation with the simultaneous output of printed information.

The 5005 COMPUTYPER billing machine is of advanced logical design, implemented by microminiature technology and provides a new dimension of performance, flexibility and reliability. It uses the delay line technique for program and data storage.

Internal program storage can accommodate up to 406 commands. There are 5 independent storages, each of a 12 digit capacity.

The input/output unit for the electronic processor is a heavy-duty electric typewriter. (Figure 1.) This unit is used to enter and print figures and type descriptive information on documents. Program tapes are loaded into the electronic unit via a special reader on the writing machine.

Three operating registers are contained

within the arithmetic unit. All data sent to and from the processor, or transferred within it, are automatically aligned around a fixed decimal point in the operating registers. Further, the decimal point is automatically aligned in all arithmetic operations.

The following paragraphs outline the functional and operational requirements of the 5005 COMPUTYPER billing machine.

TECHNOLOGY

The 5005 COMPUTYPER billing machine employs integrated circuits which are manufactured on chips of silicon and greatly reduce the need for discrete components.

One small integrated circuit provides the capability previously obtained from a combination of separate or discrete diodes, transistors and capacitors. Integrated circuits provide advanced equipment reliability and reduce greatly the amount of space required to house logic units of ever-increasing complexity.

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Figure 1. Self-contained Unit.

SECTION II

SPECIFICATIONS

The 5005 COMPUTYPER billing machine is designed and engineered to provide maximum reliability and flexibility. This section describes the physical specifications of the 5005 COMPUTYPER billing machine.

Size - 28" long, 23" wide, 10" high
 Weight - 100 pounds
 Power - 100, 120, 200, 220 and 240 volt,
 50/60 cycle AC,
 +10%, -15% tolerance

ELECTRIC TYPEWRITER

The printing unit of the 5005 is a heavy-duty electric typewriter. This machine has all the features found on a standard typewriter, plus additional features designed especially for 5005 operation. Various features of the 5005 printing unit are described below.

CARRIAGE

A 16" carriage (see figure 2) is standard,

although a 20" carriage is available as an optional feature. The following chart lists the maximum paper size and writing line for both carriage lengths.

<u>Carriage</u>	<u>Maximum</u>	
Length	Paper Size	Writing Line
16"	14 3/16"	13 9/16"
20"	18 3/16"	17 9/16"

Following are the various standard features located on the carriage:

Carriage Release Buttons

Located on both ends of the carriage, when depressed, they allow the carriage to be moved freely, and to be manually positioned at any point to the right of the margin stop. Power should be on in order to move carriage.

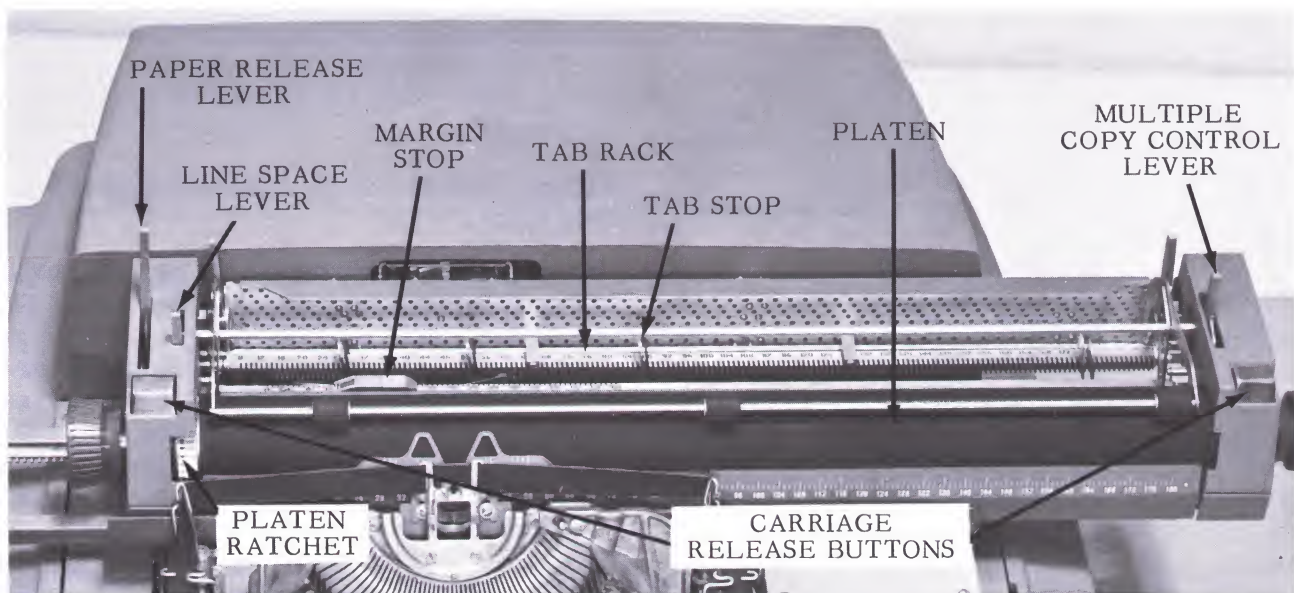


Figure 2. Carriage, Showing Standard Features.

Margin Stop

The margin stop (figure 3) may be manually set at any letter space along the margin rack and fixes the point of extreme right carriage movement.

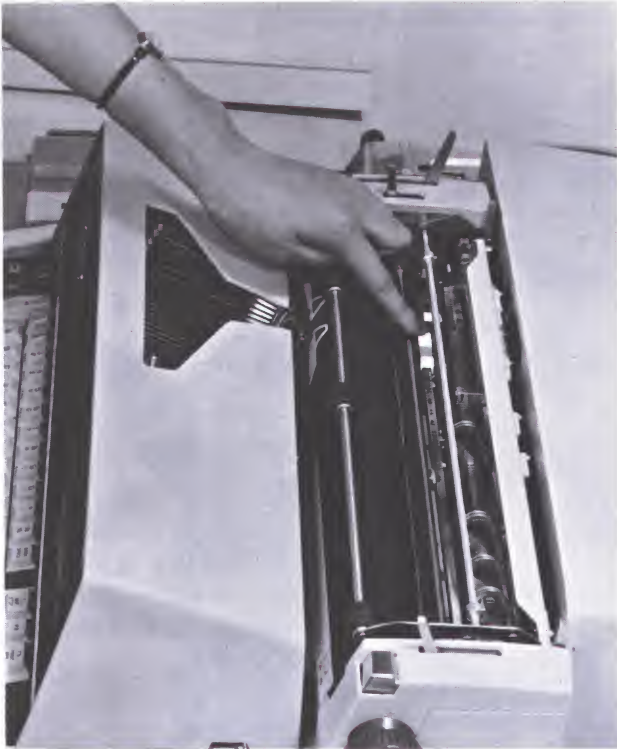


Figure 3. Margin Stop.

Paper Release Lever

When moved toward the operator, all pressure on the platen is released and the paper in the platen moves freely. This lever is normally used to adjust horizontal alignment of forms as they are inserted.

Multiple Copy Control Lever

Moves the platen back and forth to compensate for the thickness of multiple documents and carbons. As a general rule, this lever should be in the forward position (toward the operator) when one thickness of paper is being typed. Advance the lever for additional thicknesses, as needed, to prevent unwanted embossing.

Platen

A #2 hardness platen is standard. Platens of other sizes and degrees of hardness for different types of document preparation are available options.

Platen Ratchet

Controls the vertical line spacing of type on the document. A 33-tooth ratchet is standard and gives six or three lines to the inch. However, platens are available in a variety of ratchet spacing, giving more or fewer lines to the vertical inch.

Line Space Lever

Selects single and double line spacing.

Tab Rack

Provides for right to left carriage movement to predetermined points. Tabulation is initiated by the TAB key/lever and is terminated by the manual placement of tab stops along this rack (figure 4). The double tab stops may be placed at any letter space position along this rack, but the minimum movement must be at least two letter spaces.



Figure 4. Tab Rack.

KEYBOARD

Figure 5 shows the keyboard common to all 5005 units.

There are 45 printing keys in four rows, and six format control keys, including the space bar. Format control keys (carriage return, tab, backspace, space) function normally only during "type only" mode and appropriate programs. They are also used for sequence selection. These are as follows:

Carriage Return

When operated manually or automatically, this key causes the carriage to return to the left margin.



Figure 5. Standard Keyboard on all 5005's.

Tabulate

Manual or automatic operation of the Tabulate Key causes right to left carriage movement at high speed. Termination is determined by the placement of tab stops in the tab rack.

Space Bar

Operation of the space bar, either manually or automatically, causes the carriage to move one space forward (right to left).

Back Space

Operation of this key, either manually or automatically, causes the carriage to move one space back (left to right).

Basket Shift

This key, while depressed, shifts the type basket to the Upper Case position.

Shift Lock

This key shifts and locks the type basket in Upper Case position. A second depression of this key releases the type basket to the Lower Case position.

Basket Shift and Shift Lock keys are provided on both sides of the keyboard.

Power and Control Switches

There are two manually-operated butterfly-type switches (see figure 6) located at the right of the keyboard.

POWER

- (a) The power switch is a two-position switch that turns the power ON or OFF for the central processor.
- (b) The control switch is a three-position switch that controls the operation of the typewriter. These positions are as follows:

ON

OFF

PUNCH OFF (When in this position, the typewriter is on; however, if the machine utilizes a punch, it is not active.)

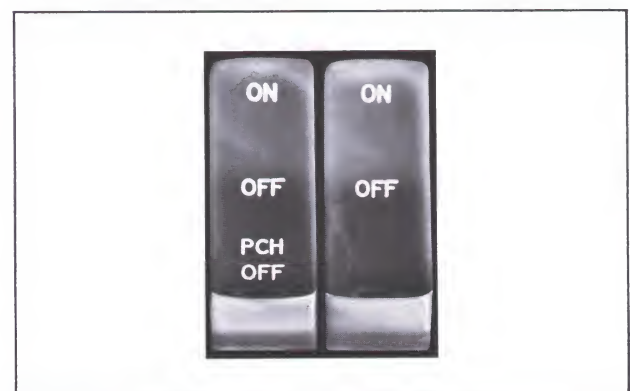


Figure 6. Power and Control Switches.

Type Style

Systems 310 type style is standard on the 5005 electric typewriter. This is a mono-spacing type style, which provides for the typing of 10 characters to the horizontal inch.

Manual Selector Keys

The keys labelled A-B-C-X-Y-Z are the manual selector keys, (see figure 7) and are used to modify selected sequences. Each key has its own butterfly indicator (see figure 8), showing the condition of the selector.



Figure 8. Butter-fly Indicators.

PRGM Key

The key labelled PRGM (see figure 7), is the Program Key. Its main function is to start the loading of the program.

NOTE: The function of manual selector and program keys will be explained in Section III of this manual. They are mentioned at this time only to acquaint the reader with their position with regard to the electric typewriter.



Figure 7. Manual Selector Keys.

CENTRAL PROCESSOR

The central processor is located inside the electric typewriter, together with the program storage, the working registers and the data storages. The latter components are described below:

Program Storage

A program is composed of a series of program commands grouped in one or more sequences and stored in the program storage. The program storage is capable of holding a total of 406 commands.

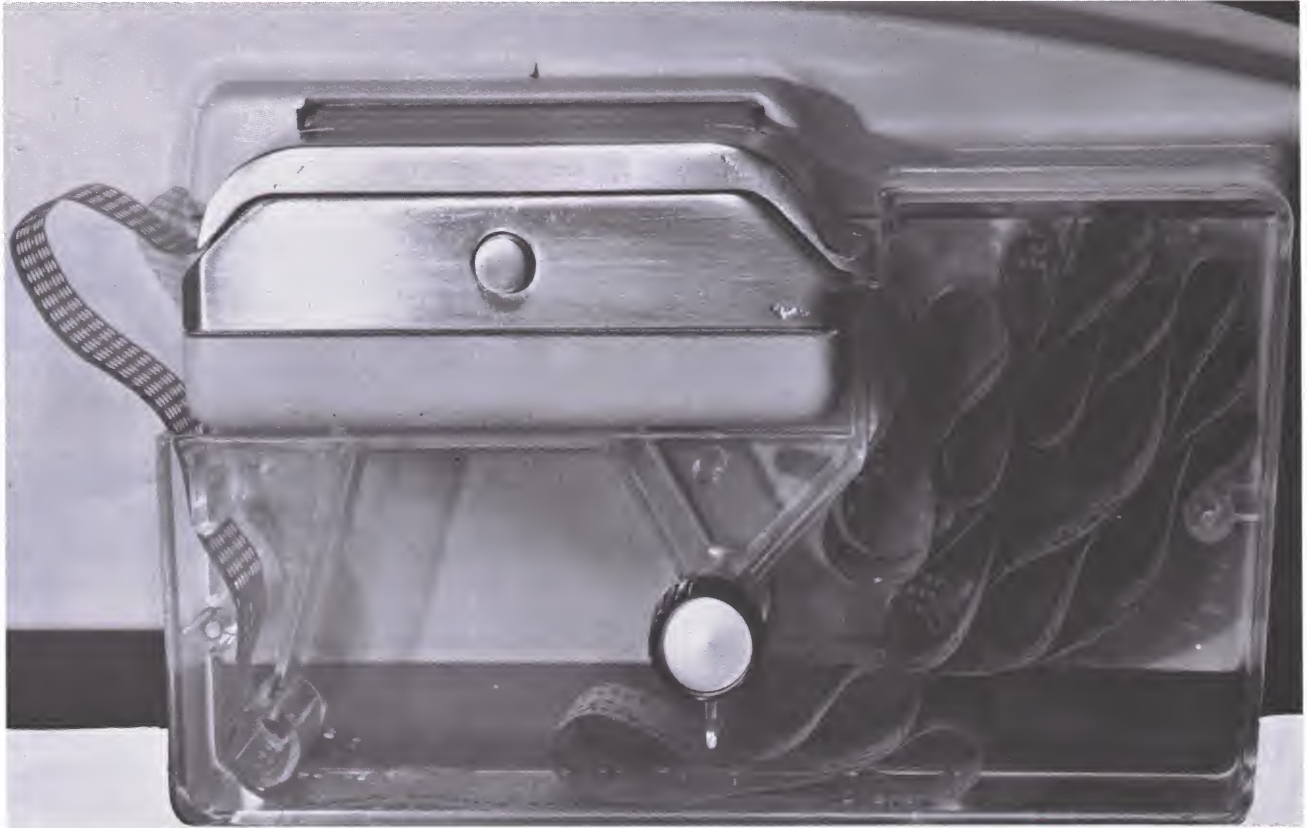


Figure 9. Mylar Tape in Reader.

Each operation or address is a single command.

The program, which is punched in Mylar tape, is loaded into the program storage through a special brush-contact reader at the speed of 70 characters per second. (Figure 9.)

Working Registers

The 5005 Central Processor has three working registers which are labelled Ra (Active Register), Rp (Passive Register) and Rm (Multiplication Register).

Input and output data to or from the processor, transfer or retrieval of data from or to storages is made via the active register.

Arithmetic operations are performed in the working registers.

Each of the three working registers has a

capacity of 12 digits. They have a fixed decimal point, located between the third and the fourth digit (9.3).

The least significant digit position in Ra is for rounding purposes only. It cannot be used for input or output, i.e., only two decimal positions can be entered.

The Multiplication Register (Rm), which is automatically addressed and cleared before a multiplication is performed, can also be addressed by a program command. Thus, it can be used as temporary storage, until multiplication is required.

Data Storages

Each storage is individually addressable and instantly available for processing by the 5005.

Each of the five storages has a capacity of 12 digits.

CODE CHART

5005 COMPUTYPER billing machine

Instructions			Ø	1	2	3	4	5	6	7
Sequence	(*)	A		1	2	3	4	5	6	7
Codes	(*)	J	8	9	TAB	CR			BSP	15
Function	(+)	B	ERR	1	2	3	4	5	6	7
Codes	(+)	K	8	9	10	11	12	13	14	15
Type	(+)	C	%	/	U	S	M	T	C	DAS
Commands	(+)	L	LCA	UCA	TAB	CRE	PER	AST	BAC	SPA
Digit	(*)	D	—3	—2	—1	1	2	3	4	5
Index	(*)	M	6	7	8	9	10	11	12	13
Input	(*)	E	ENT	EN2	ENO	BLIND ENTRY	PRI	PR2	PRO	PRA
Output	(*)	N	RSI	CPR	PVA	PFI	SKI	ADV	HAL	CSE
Selectors		F	ABS	MSA	MSB	MSC	MSX	MSY	MSZ	ESE
Storages		O		1	2	3	4	5	Rm	
Arithmetic	(+)	G	RS2	LEFT	ADD	SUB	ACC	STO	SSI	RS1
		P	* REC	* TRU	* INV	* CSI	* RIGHT	* CFI	* MUL	
Protect	(*)	H		1	2	3	4	5	6	7
Seq. Codes	(*)	Q	8	9	10	11	12	13	14	15

(*) Complete instruction lines, or individual instructions, so marked, destroy the contents of the Digit Register.
(+) Instructions in these lines can be repeated.

OUTPUT TAPE CODES (ODD PARITY)

8	7	6	5	4	3	2	1	
8								Ø H
							1	Ø A
						2		Ø B
				3				Ø D
				3	2	1		Ø G
				4				1 H
				4		2	1	1 C
				4	3		1	1 E
				4	3	2		1 F
			5			2	1	2 C
			5		3		1	2 E
			5		3	2		2 F
			5	4			1	3 A
			5	4		2		3 B
			5	4	3			3 D
			5	4	3	2	1	3 G
			6			2	1	4 C
			6		3		1	4 E
			6		3	2		4 F
			6		4		1	5 A
			6		4	2		5 B
			6		4	3		5 D
			6		4	3	2	1 5 G
8			6	5				6 H
			6	5			1	6 A
			6	5		2		6 B
			6	5		3		6 D
			6	5		3	2	1 6 G
			6	5	4			7 H
			6	5	4		2	1 7 C
			6	5	4	3		1 7 E
			6	5	4	3	2	1 7 F

8	7	6	5	4	3	2	1	
	7					2	1	Ø L
	7				3		1	Ø N
	7				3	2		Ø O
	7			4			1	1 J
	7			4		2		1 K
	7			4	3			1 M
	7			4	3	2	1	1 P
8	7		5					2 Q
	7		5				1	2 J
	7		5			2		2 K
	7		5		3			2 M
	7		5		3	2	1	2 P
	7		5	4				3 Q
	7		5	4		2	1	3 L
	7		5	4	3			3 N
	7		5	4	3	2		3 O
8	7	6						4 Q
	7	6					1	4 J
	7	6				2		4 K
	7	6			3			4 M
	7	6			3	2	1	4 P
	7	6		4				5 Q
	7	6		4		2	1	5 L
	7	6		4	3			5 N
	7	6		4	3	2		5 O
	7	6	5			2	1	6 L
	7	6	5		3			6 N
	7	6	5		3	2		6 O
	7	6	5	4			1	7 J
	7	6	5	4		2		7 K
	7	6	5	4	3			7 M
	7	6	5	4	3	2	1	7 P

Command List

COMMAND STATEMENT	MNEMONIC	REPEAT or DESTROY	OBJECT CODE	MATHEMATICS
AB Selector	ABS		ØF	
Accumulate	ACC	R	4G	$Ra + Sx = Sx; Ra = Ra$
Add	ADD	R	2G	$Rp + Ra = Ra; Rp = Rp$
Advance	ADV		5N	
Asterisk	AST	R	5L	
Backspace	BSP	R	6L	
Call Sequence	CSE		7N	
Carriage Return	CRE	R	3L	
Change Sign	CSI		3P	$Ra \rightarrow -Ra$
Check Protect	CPR		1N	
Constant Five	CFI		5P	$Ra + CFI = Ra$
Dash	DAS	R	7C	
Electronic Selector	ESE		7F	
Enter	ENT	R	(Ø—2) E	Entry $\rightarrow Ra$
Error	ERR		ØB	
Function Code	FCO		(1—7) B (Ø—7) K	
Halt	HAL	R	6N	
Invert	INV		2P	$Ra \rightarrow Rp; Rp \rightarrow Ra$
Lower Case	LCA	R	ØL	
Manual Selector A	MSA		1F	
Manual Selector B	MSB		2F	
Manual Selector C	MSC		3F	
Manual Selector X	MSX		4F	
Manual Selector Y	MSY		5F	
Manual Selector Z	MSZ		6F	
Multiply	MUL	R	6P	$Rp \times Ra = Ra; Rp = Rp$
Period	PER	R	4L	
Percent Symbol	PSY	D	ØC	
Slash	SLA	R	1C-	
Preset Digit Index	PDI	D	(Ø—7) D (Ø—7) M	
Print	PRI	D	(4—6) E	$Ra \rightarrow$ Printer (and punch)
Protect Sequence	PSE	D	(1—7) H (Ø—7) Q	
Punch Fixed	PFI		3N	
Punch Ra	PRA	D	7E	$Ra \rightarrow$ Punch
Punch Variable	PVA		2N	
Recall	REC		ØP	$Sx \rightarrow Ra; Sx = Sx$
Reset Selectors 1	RS1	R	7G	
Reset Selectors 2	RS2	R	ØG	
Reset Sequence Index	RSI		ØN	
Select Storage	SST		(1—6) O	
Sequence	SEQ	D	(1—7) A (Ø—7) J	
Shift Left	SLE	R	1G	
Shift Right	SRI	D	4P	
Skip	SKI		4N	
Space	SPA	R	7L	
Start	STA	ZZZ		
Step Sequence Index	SSI	R	6G	
Stop Read	SRE	Y		
Store	STO	R	5G	$Ra \rightarrow Sx; Ra \rightarrow Ra$
Subtract	SUB	R	3G	$Rp - Ra = Ra; Rp = Rp$
Tabulate	TAB	R	2L	
Truncate	TRU	D	1P	$12.456 \rightarrow 12.400$
Type	TYP	R	(2—6) C	
Upper Case	UCA	R	1L	

SECTION III

OPERATING FEATURES

This section describes the principles of operation of the 5005 COMPUTYPER billing machine. It includes a description of the operation of the electric typewriter, the working registers and the storages. Also the method of sequence addressing, preparation of the object program tape and the commands which govern the operation of the 5005.

INPUT/OUTPUT

The ten numeric keys do not operate the type bars, but only enter the digits into the central processor. The processor in turn operates the type bars. This ensures that the digit printed is the same as that entered. The speed of input is not affected by this remote operation of the type bars.

The output from the processor is printed by the electric typewriter. In addition to the readout of the active register, the period, dash, letters U, C, M, S and T and both Upper and Lower Case characters of key positions 12, 51 and 55 can be operated by the processor under program control.

WORKING REGISTERS

All entries into the electronic processor from the electric typewriter, transfers of data to or from storages, and readouts from the processor to the typewriter are made via the active register.

On an entry command, the contents of the active register are transferred to the passive register, the previous contents of the passive register are lost; the active register is cleared and ready to accept the entry.

Capacities of an entry to, or a readout from, the active register are under program control.

Each input or output must be preceded by the command "preset digit register" to control the left-of-decimal capacity. Right-of-decimal capacity is defined by the Enter or Print command address.

Spaces can be entered in the leading positions of an input when the left-of-decimal capacity is not fully used. These are stored as zeros and cause typing of spaces. After the input of a digit, the Space Bar is inoperative.

The left-of-decimal capacity can also be increased, prior to entry of the first digit, by backspacing. The Backspace key can also be used to correct erroneously keyboarded entries. In addition to moving the carriage back one space, depression of this key will erase the last digit in the active register. The key can be depressed as many times as there are digits to be corrected.

The contents of the active register can be printed or transferred to a storage and still remain in Ra for further processing.

To perform a multiplication, the multiplication register is also used. Before the multiplication starts, Rm is automatically addressed and cleared.

During a readout from the active register to the electric typewriter, the insignificant zeros are automatically converted to spaces. It is possible to print asterisks in place of spaces for check protection.

STORAGE OPERATION

The 5005 COMPUTYPER billing machine has six addressable storage locations, each with a capacity of 12 digits. Storages are identified by the number 1 to 5 and Rm (6).

When data has to be transferred to or from a storage, the storage will be determined by the address of the last "Select Storage" command. This is because a storage address is not specified in the Accumulator, Store and Recall commands.

A storage remains addressed until a further "Select Storage" command is given, or when a multiplication is performed which automatically addresses the multiplication register (Rm).

A transfer to or from storages is destructive or non-destructive, depending on the commands.

SEQUENCES

The logical segments of a 5005 program are called "Sequences". These sequences may vary in length and consist of those commands which are required for execution of a specific portion of a program. The total number of commands over all sequences must not exceed 406. Normally, each sequence is concerned with a particular routine, which is required for one portion of the program.

For example, an invoice program could consist of three sequences: one for the header, one for each invoice line and one for the total line. However, the flexibility of the 5005 programming permits a great deal of variation in this procedure; a program sequence can consist of any set of commands which is required for the solution of a given problem.

SEQUENCE ADDRESS

A sequence address is used to identify the starting point of a program sequence and the end of the previous sequence (sequence separator).

The sequence address consists of a single character.

There are fifteen sequence addresses available. Thirteen of these can be manually selected by the following keys:

Sequence Address	Key
1 to 9	Numeric 1 to 9
10	Tabulate key
11	Carriage Return
14	Backspace Key
15	Space Bar

The sequence addresses 12 and 13 have no related keys and can therefore only be started by special commands within the internal program.

When the sequence address is entered from the writing machine, its value is stored in the "Sequence Register" and the processor will proceed to execute commands in the specified sequence.

On termination of the selected sequence, the Sequence Register will be reset awaiting the manual entry of the next required sequence address.

By initiating logical commands, it is possible to iterate the sequence or to branch to another sequence.

SEQUENCE PROTECTION

To avoid operators' error, a sequence can be prohibited from manual selection by the use of the command "Protect Sequence". Such a sequence can only be selected by program commands.

TABULATION ON AN ENTRY

If a manual tabulation is given on an entry command, prior to the entry of the first digit, the following conditions arise:

- The active register will contain zeros.
- The sequence register is incremented by one.
- The sequence is interrupted.
- The sequence corresponding to the new value of the sequence register is selected and executed.

MANUAL SELECTORS

The 5005 is equipped with six manual selectors which are used to execute one or two alternative commands. Each selector can be addressed by a command and it is then examined to see if it is in a normal or transferred condition. If the related selector is in a normal condition, the command following the selector address is executed and the next command is skipped. If in the transfer condition, the first command is skipped and the second command is executed. The indicator is set when the selector is in the transferred condition.

The manual selectors can be reset immediately by a program command or manually, and their corresponding indicators reset.

There is one special command "AB Selector", which is operative when either one or both manual selectors A or B have been set.

ELECTRONIC SELECTOR

The "Electronic Selector" command tests the contents of the selected storage. If positive, the selector remains in normal condition, if negative, it assumes a transfer condition. Depending upon the condition of the selector, one of the two following commands is executed as for manual selectors.

PROGRAM COMMANDS

The commands contained in the program are held in the program storage area, where they are available for execution. Program storage is completely independent of data storage. Commands are stored consecutively, each command requiring one position.

A command is represented by two object codes in the object tape, a digit and a character respectively and is called "code pair".

The program is read-in by the integral tape reader and stored in the program storage area after automatic conversion of the code pairs into single commands.

A summary of all 5005 commands follows.

A B SELECTOR

Tests selectors A and B, if either one is set, the TRANSFER program is selected.

ACCUMULATE

The contents of Ra are added to the contents of the selected storage. Ra remains unchanged.

ADD

The contents of Ra are added to the contents of Rp. The sum is developed in Ra. Rp remains unchanged.

ADVANCE

Proceeds with the execution of the program without any effect on registers or storages.

ASTERISK

Causes the printing of the asterisk (*).

BACKSPACE

Activates the backspace mechanism of the printing unit.

CALL SEQUENCE

The sequence corresponding to the value of the Sequence Register is automatically selected and executed.

CARRIAGE RETURN

Activates the carriage return mechanism of the printing unit.

CHANGE SIGN

The sign of Ra is changed from positive to negative or negative to positive. Zero will always be positive. Negative is represented by its complement.

CHECK PROTECT

Causes the printing of ASTERISKS in place of insignificant spaces in the next print command.

CONSTANT FIVE

A constant 5 will be added to the contents of Ra in the digit position specified by the setting of the Digit Register. The digit register will not be reset after completion of this command.

DASH

Causes the printing of the dash (-).

ELECTRONIC SELECTOR

Tests the contents of the selected storage. If negative, the transferred program command is executed. Zero will always be positive.

ENTER

Data manually entered from the keyboard are transferred to Ra. Left-of-decimal control will be according to the setting of the digit register and without decimal digits. The previous contents of Rp are lost.

ENTER 0

Same command as ENTER with the exception that in the last position left of the decimal point, the operator is obliged to enter a digit because the space bar and the tab key are locked.

ENTER 2

Same functioning as ENTER 0, but two decimal digits must be entered. The decimal point is automatically typed in the correct position. It is not possible to backspace over the decimal point.

HALT

The program is halted for the typing of descriptive data. The HALT condition is terminated:

- a. by a TAB, unless these are multiple commands in succession.
- b. by a TAB immediately following the typing of a letter, digit or space.

NOTE: A manual CARRIAGE RETURN does not terminate the halt condition neither does one or more TAB's immediately following one or more CARRIAGE RETURN's.

INVERT

The contents of Ra and Rp are interchanged.

LOWER CASE

Places the printing unit in a lower case condition.

MANUAL SEL A

Tests selector A. If set, the Transfer program is selected.

MANUAL SEL B

As above except test is on B.

MANUAL SEL C

As above except test is on C.

MANUAL SEL X

As above except test is on X.

MANUAL SEL Y

As above except test is on Y.

MANUAL SEL Z

As above except test is on Z.

MULTIPLY

The contents of Rp are multiplied by the contents of Ra. The product is developed in Ra and Rm. Rp remains unchanged, the previous contents of Rm are lost. The Digit Register is reset.

PERCENT SIGN

Causes the printing of the percent (%) sign.

PERIOD

Causes the printing of the period (.).

PRESET DIGIT REGISTER

The DIGIT REGISTER is set to the value specified by the command address. The Digit Register (Rd) may contain a value ranging between -3 and +13 with the exception of zero. It is used in the following conditions:

- a. Preceding an ENTER or PRINT command, it determines the left-of-decimal capacity of the entry or readout.
- b. Preceding a "Constant Five" command, it is used to locate the position in Ra to which 5 must be added, and after execution the Digit Register will remain at the selected setting until reset by another command influencing the Digit Register.
- c. Preceding the TRUNCATE command, it determines the digit location in Ra from which the contents are truncated.

Commands indicated by an R in the commands list, can be repeated by preceding them with the command "Preset Digit Register". This latter command is used to indicate the number of times it is to be repeated.

The Digit Register is automatically reset on completion of the repeating command for which it was set, with the exception of the command "Constant Five". The commands which destroy the digit register setting are marked with a "D" on the commands list.

PRINT

The contents of Ra will be printed out. Left-of-decimal control will be according to the setting of the Digit Register and without digits right-of-decimal. The Digit Register will be reset, Ra will remain unchanged.

PRINT 0

Same command as PRINT, but a zero will be printed instead of a space in the last position left of the decimal point.

PRINT 2

Same function as PRINT 0, but two decimal digits will be printed. The decimal point will automatically print in the correct position.

PROTECT SEQUENCE

If a sequence is required to be prohibited from manual initiation, it must begin with a special sequence code. The 15 protect sequence codes are 1H to 7H and 0Q to 7Q. Such sequence can only be started by a branch operation, but not by a manual selection.

RECALL

The contents of the selected storage are transferred to Ra. The previous contents of Ra are transferred to Rp, the previous contents of the storage remain unchanged. The Digit Register is reset.

RESET SELECTORS 1

Manual selectors A, B and C are immediately reset to normal.

RESET SELECTORS 2

Manual selectors X, Y and Z are immediately reset to normal.

RESET SEQUENCE REGISTER

The Sequence Register is reset to 1 (one).

SELECT STORAGE

The addressed storage is activated to transfer or receive data to or from Ra when the next Accumulate, Store or Recall command is executed.

SEQUENCE

If a sequence is required to be initiated either by a branch operation or manually by the operator, it must begin with one of the 13 non-protect sequence codes: 1A to 7A and 0J to 7J.

SHIFT LEFT

The contents of Ra are shifted left one decimal position.

SHIFT RIGHT

The contents of Ra are shifted right one decimal position. The Digit Register is reset.

SKIP

The next program step is passed over without execution, and the program continues. Skip command must not be used as the normal or transferred step following a selector command.

SLASH

Causes printing of the slash (/).

SPACE

Activates the space mechanism of the printing unit.

STEP SEQUENCE REGISTER

The Sequence Register is incremented by 1.

STORE

The contents of Ra are transferred to the selected storage. Ra remains unchanged, the previous contents of the storage are lost.

SUBTRACT

The contents of Ra are subtracted from the contents of Rp. The difference is developed in Ra; Rp remains unchanged.

TABULATE

Causes the carriage of the printing unit to tabulate to the next tab stop position.

TRUNCATE

The contents of Ra are truncated from the right up to and including the position specified by the Digit Register setting. The digits affected are replaced by zeros. The Digit Register is reset.

TYPE

Causes the printing of the character designated by the command address. This can be U, C, M, S, T.

UPPER CASE (Basket Shift)

Shifts the type basket to the Upper Case position.

OBJECT PROGRAM TAPE PREPARATION

The object program tape can be produced on any standard FLEXOWRITER* automatic writing machine. Code compatibility is ensured, since only the digits 0 thru 7 and the characters A-H and J thru Q are used to make up the commands. All of these characters, and the load start and load stop codes, have the same coding on all keyboards.

The contents of an object program tape must be in the following order:

1. A leading end of thirty (minimum) tape feed codes.
2. One "Y" code.
3. Up to 406 code pairs (maximum) covering program commands.
4. Three "Z" codes.
5. A trailing end of thirty (minimum) tape feed codes.

As it is imperative to load the object program tape in reverse, the "Z" codes act as "load start" and the "Y" code acts as "load stop".

The 5005 requires a clean object program tape. Only the codes that make up the commands are allowed in the tape. The one digit and one character making the code pair are not allowed to be separated by any code.

Code pairs or sequences can be separated by one or more Carriage Return(s) to assist editing of the object program print-out.

The codes in the object program tape are checked for parity when loaded. Any even code will cause the reader to stop.

REMOVABLE PLASTIC CARTRIDGE

For ease of loading, the object program tape must be encased in a removable plastic cartridge. Each cartridge can hold approximately 80" of Mylar tape. (Figure 10.)

Certain steps must be followed in order to correctly insert the Mylar object program tape in the plastic cartridge.

1. Loop and join the Mylar object program tape; the glued overlap must not exceed two tape feed codes. Insure that the holes are free from glue.
2. Open the plastic cartridge by removing the two screws in the cover. (See figure 11.)
3. Turn the Mylar object program tape so that the printed face of the tape is inside the loop.
4. Insert the tape in the cartridge with channel one nearest to the cover and follow the plastic guides. (See figure 12.)

5. Replace the cover and coverscrews. (See figure 13.)

NOTE: The tape will be automatically looped at the first loading of the program.

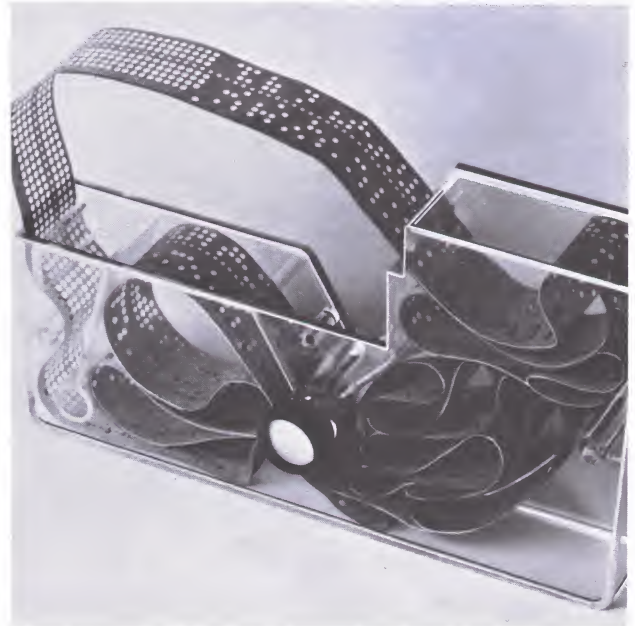


Figure 10. Tape Cartridge.



Figure 11. Screws to remove cover of cartridge.



Figure 12.

PROGRAM LOADING

To load the program, proceed as follows:

1. Open the tape hold-down arm on the reader by pushing the button. (See figure 14.)

Place the cartridge on the reader, by inserting the snap lock into the frame lock. (See figure 14.)

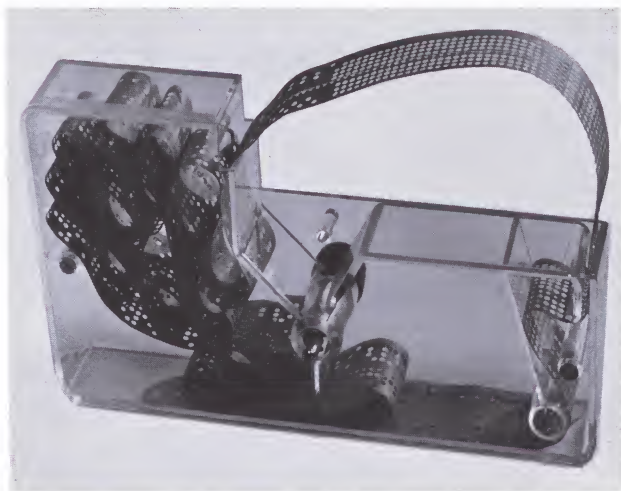


Figure 13.

2. Insert the Mylar object program tape in the reader. Make certain that the feed holes are engaged on the pinwheels.
3. To close, push down the tape hold-down arm.
4. Depress the PRGM key.

When the program is loaded, the top left indicator is set, showing that the 5005 is in the operate mode. Execution of the program begins when a sequence address is entered from the writing machine. The top right indicator is set during the execution of the sequence and reset on completion.



Figure 14.

USE OF MODEL 5610 COMPUTYPER* DATA PROCESSOR

A model 5610 COMPUTYPER data processor Software Package has been produced to translate from a Source Program Tape in full English Commands or Mnemonics to a 5005 Object Program Tape.

Any incorrect command will cause the typing of "ERROR" and the reader will stop. An incorrect address will cause the typing of "ADDRESS ERROR" and the reader will stop. In both cases a manual correction can be made, no erroneous codes having been punched in the Object Tape. After correction, depress "START READ" for continuation of the translation.

A complete check on the validity of all addresses is performed. For example, the command "SEQUENCE" calls for an address of 01 thru 11, 14 and 15. Entry of address 00, 12, 13, 16 or greater will cause the typing of "ADDRESS ERROR" and the reader will stop.

Object codes are counted during translation and at the end of each sequence the total of object code pairs in the sequence is printed out. At the end of translation, the total number of object code pairs in the program is printed out.

The start of the source program tape should be a "TRA" or "TRANSLATE 5005 XXXXXX Program", followed by two carriage returns and a TAB code. The "Y" code will then be automatically punched as the first code in the object tape.

The standard 5610 Translation Panel can be used with PMS 1 down.

If a sequence contains more than 30 object code pairs, a "CR" code is automatically punched in the object tape for ease of print out.

The end of the source tape must contain the command "FINISH" or "FIN", this will not only cause the printout of the total number of object code pairs in the program, but will automatically punch the three required "Z" codes at the end of the object tape.

5610 TRANSLATION COMMANDS

TRANSLATE

Initiates translation, clears storages for object count. Causes the punching of "Y" as the first code in the object tape.

END

Identifies the end of a sequence and causes the printing of the total object code pairs in the sequence.

A "CR" code is the only punching that takes place.

FINISH

Indicates the end of translation. Causes the printing of the total object code pairs in the program. Causes the punching of three "Z" codes at the end of the object tape. No other punching takes place.



Figure 15.

SECTION IV

PAPER TAPE PUNCH (OPTIONAL)

The 5005 COMPUTYPER invoicing machine with its modular tape punch introduces a new concept to source document origination. This unit not only processes invoices and other documents at electronic speeds, but can selectively produce an output paper tape containing data and the required control codes for processing on any large computer.

To achieve this, coding of the output tape is entirely free and data can be punched in fixed or variable word lengths.

The output tape can be in a 5, 6, 7 or 8-channel code structure. The 5005 is available with either odd or even parity check, as required. 8-Channel coding and odd count parity check have been assigned as standard.

The paper tape punch is attached on the left side of the writing unit and can be field or factory installed easily at any time.

PUNCH COMMANDS

Error

Causes the punching of the designated error code.

Function Code

Causes the punching of the designated function code as related to the command address.

Punch Fixed

A fixed word length control command, applicable to the next Print, Enter or Punch Ra command. Insignificant spaces are punched as zeroes. Operation of the backspace key is prohibited. Operation of the punching of the decimal point is suppressed. Tab key is prohibited.

Punch Ra

The contents of Ra will be punched with a left-of-decimal control according to the

setting of the digit register - and 2 decimal places to the right-of-decimal.

The digit register will reset. Ra will remain unchanged. Printing is suppressed.

Punch Variable

A variable word length control instruction, applicable to the next Print, Enter or Punch Ra command. Insignificant spaces and zeroes are suppressed. Backspace key is allowed to operate, but no code will punch. The punching of the decimal point is suppressed. Tab is prohibited after entry of a significant digit.

CONTROL SWITCH

This is a three-position switch, that controls operation of the typewriter and the integral paper tape punch. These positions are as follows:

ON - when in this position, the typewriter and the punch are in an ON condition.

OFF - when in this position, the typewriter and the punch are in an OFF condition.

PCH OFF - in this position, the punch only is in an OFF condition.

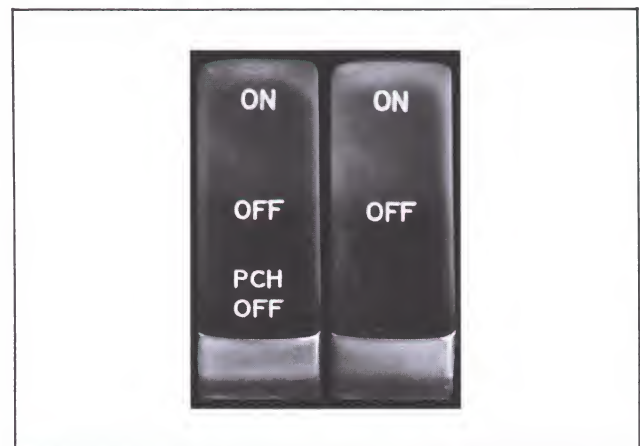


Figure 16.

NOTE: Regardless of the position of the control switch, the central processor remains in an ON condition.

CONTROL AND SAFETY MEASURES ON INPUT AND TAPE OUTPUT

A safety system is incorporated that prohibits the operation of any keys which could cause erroneous codes in the output tape.

These keys are made inoperative electronically, so that depression has no effect on processor or output.

Input

The following conditions exist when an "ENTER" command is executed:

1. The carriage return key is always inoperative.
2. When the electric typewriter is in upper case, the numeric keys, the tab key, space bar and backspace key are inoperative.
3. Backspace and tabulate key are inoperative when any "ENTER" command is preceded by a "Punch Fixed" command. When in a variable word length punching field, backspace is allowed to increase the left-of-decimal capacity by one, up to nine digits left-of-decimal.
4. Before the entry of the first significant digit, a "TAB" will terminate the entry, leaving zeroes in Ra. It will also interrupt the program sequence, increment the sequence register by one, and automatically select the sequence with the new value of the sequence register.
5. When the address of the enter command is 0, the above conditions apply, with the exception that the space bar and tabulate keys are locked in the first digit position left-of-decimal. The operator must enter a digit (0 thru 9) in this position.
6. When the address of the enter command is 2, all the above conditions apply, but in addition two decimal digits must be entered. The decimal point is automatically printed in the correct position. The backspace key may be used to correct

wrong digits, but only left- or right-of-the-decimal point. Backspacing over the decimal point is prohibited.

Punched Output

When a "PRINT" or "ENTER" command is preceded by a "PUNCH FIXED" command, leading spaces are punched as zeroes. Period (decimal point) will print but not punch.

When a "PRINT" or "ENTER" command is preceded by a "PUNCH VARIABLE" command, insignificant spaces and zeroes are not punched. The period (decimal point) will print, but not punch. When the address of the print or enter command is 0 or 2, the first digit position left of decimal will only punch or print as a zero or a digit.

Error Code

The ERROR CODE will automatically be punched under the following conditions:

1. When a sequence is interrupted by depression of the PRGM key, if a code has been punched since the last programmed carriage return.
2. If a parity error is detected.
3. If the punch tape contact is closed, whenever the tape-hold-down arm is left open or if there is undue tension on the tape being supplied to the punch.

Output Codes

Complete flexibility of output code structure is provided as each output code in the object program tape must be comprised of one digit and one letter, which, when read by the processor, will be converted to the single 7 bit code according to the numeric and alpha character selected from the Output Code Table. (See figure 18).

The processor will automatically add an 8th bit to the output code when the output code has an even number of bits when parity check is odd, or vice versa.

For example, if the structure of the error code consists of bits 1, 3, 4, 5 and 7, the object program code would be 3N.

OUTPUT CODE TABLE													
8	4	3	2	1			5	6	56	7	57	67	567
8						0H	2H	4H	6H	0Q	2Q	4Q	6Q
				1		0A	2A	4A	6A	0J	2J	4J	6J
			2			0B	2B	4B	6B	0K	2K	4K	6K
			2	1		0C	2C	4C	6C	0Q	2Q	4Q	6Q
		3				0D	2D	4D	6D	0M	2M	4M	6M
		3		1		0E	2E	4E	6E	0N	2N	4N	6N
		3	2			0F	2F	4F	6F	0O	2O	4O	6O
		3	2	1		0G	2G	4G	6G	0P	2P	4P	6P
	4					1H	3H	5H	7H	1Q	3Q	5Q	7Q
	4			1		1A	3A	5A	7A	1J	3J	5J	7J
	4		2			1B	3B	5B	7B	1K	3K	5K	7K
	4		2	1		1C	3C	5C	7C	1L	3L	5L	7L
	4	3				1D	3D	5D	7D	1M	3M	5M	7M
	4	3		1		1E	3E	5E	7E	1N	3N	5N	7N
	4	3	2			1F	3F	5F	7F	1O	3O	5O	7O
	4	3	2	1		1G	3G	5G	7G	1P	3P	5P	7P

Figure 17.

